Do it yourself

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A COMPLETE GUIDE FOR THE AMATEUR

by

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and

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Fully Illustrated

LONDON

W. FOULSHAM & CO., LTD.

NEW YORK TORONTO CAPE TOWN SYDNEY

W. FOULSHAM & CO. LTD.
2-5 Old Bond Street, London, W.1

MADE IN GREAT BRITAIN
by C. TINLING & CO., LTD.,
LIVERPOOL, LONDON & PRESCOT.

FOREWORD

CARPENTRY at home provides a hobby which is not only interesting, but remunerative.

This book gives clear instructions and working drawings for making many useful articles for the home without the necessity of purchasing an expensive kit of tools. It also gives details of the various joints used in woodwork, so that the volume will appeal to the beginner as well as to those who have already had some experience of carpentry.

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Chapter I

TOOLS AND THE AMATEUR WOODWORKER

Most boys receive at least some instruction in woodworking while at school, and this is one reason for the popularity of this hobby. At the school handicraft centre, however, there was provided an adequate supply of good tools kept in order under the superintendence of a qualified master. In later life the amateur woodworker must provide and care for his own tools, and as the success of any job is dependent as much on efficient tools as on the skill of the worker, the selection and care of tools is an important matter.

It is proposed in this chapter to discuss the basic items of a tool kit with which it is possible to undertake the construction of all the items mentioned in later chapters. It is to be expected, however, that with practice more ambitious jobs will be attempted, necessitating an expansion of the kit. When this stage is reached, more advanced manuals than this will be needed, and these are available in the very wide choice of technical literature devoted to the woodworking craft.

The quality of tools

There is no such thing as a cheap tool. Shoddy tools at a low price are not cheap simply because they are not worth the money spent on them. No professional craftsman uses shoddy tools, and if the professional with all his training and experience needs the advantage of fine tools, how much more are they a necessity for the amateur.

There are about half a dozen famous names in the tool-making industry and the assistant at any good tool shop will know them all. Rely on the advice of such people ; they are specialists and it is to their advantage to sell you only satisfactory articles.

Further, the difference in price of the good and the shoddy tool is comparatively small, while the effective life of the tool is very long. I have in my kit several tools sixty and seventy years old, and their cost per year of useful life must be reckoned in coppers.

THE BASIC TOOL KIT

Planes

In these days every plane has its wood and metal equivalent, and there is no doubt in my mind that the metal version is the most useful for the amateur. Fig. 1 shows the wood and metal jack and smoothing planes.

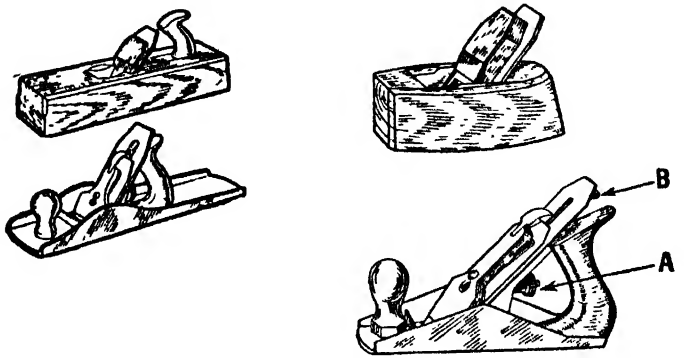


FIG. 1.

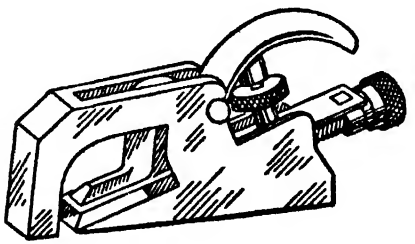


FIG. 2.

Setting of the cutting iron of the wood plane is by adjustment of the wedge by tapping with the hammer. As the plane wears, the sole of the plane must be re-trued and the mouth adjusted either by packing of the bed or by the insertion of a closing strip. It is not

necessary here to go into the technicalities of all this as by the use of the metal plane these processes are avoided.

Adjustment of the depth of cut is made by the turning of a knurled wheel (*a*), side to side adjustment by a small lever (*b*), and the mouth is widened or narrowed by means of two small set screws in the body of the plane. The steel sole cannot warp or twist and is practically indestructible. The only disadvantage of the metal plane is its brittleness ; it will rarely survive a fall on to a concrete floor. Even if that happened, however, spares may be obtained through the tool shops for every part, from a complete body casting to the smallest screw.

It is suggested that the metal smoothing plane with a body length of about 10" and a cutter width of 2¼" or 2⅜" may be used in place of both the jack and smoothing plane. The only other plane necessary for the basic kit is a rebate plane, and I suggest that the small type known as a " bullnose " (Fig. 2) be obtained. As will be seen from the drawing, the cutting iron is placed well up to the nose of the plane so that the tool may be worked well up to a corner. It is, of course, rather small and the forming of a large rebate may take a little longer than by the use of the ordinary rebate plane, but it is less expensive to buy and will be found efficient for the general run of work undertaken by an amateur.

FIG. 3.

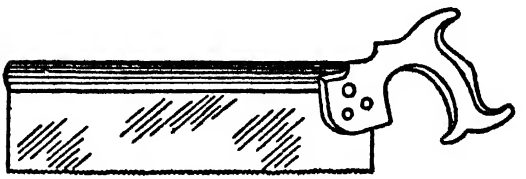


FIG. 4.

Saws

A handsaw is a necessity. Fig. 3 shows a 26" skew back saw, with 8 teeth to the inch. This is the most useful size, and every

shilling spent in obtaining the best of its kind will be repaid over and over again in accurate trouble-free working.

The backed saws commonly in use are the tenon saw and the dovetail saw. One is merely a larger version of the other, and it will

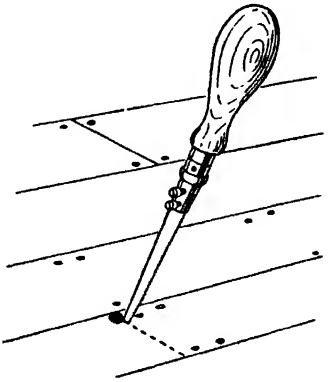


FIG. 5.

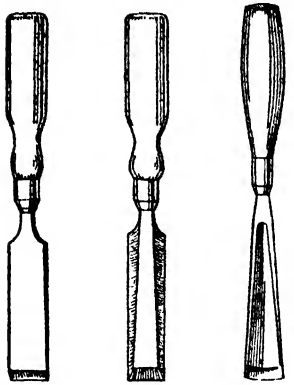


FIG. 6.

be sufficient for our purposes to obtain one 10″ saw which can be made to serve both purposes. Such a saw is shown in Fig. 4.

A pad or keyhole saw (Fig. 5) will be useful and completes the essential saws. The padsaw is used for circular work, and also in cases where a hole must be bored to afford entrance for the saw, as shown.

Chisels

The ordinary wood chisel is known technically as the " firmer " chisel, and is shown at (a) in Fig. 6. Three of these should be obtained, ¼″, ½″ and 1″ wide, and in addition a bevelled edge paring chisel (b, Fig. 6) 1¼″ wide. A scribing gouge (c, Fig. 6) about ⅜″ wide will also be useful.

Hints on sharpening edge tools will be given later in this chapter.

Spokeshave

Fig. 7 shows a metal spokeshave of the most useful type. Adjustment to the cutter is made by two knurled screws.

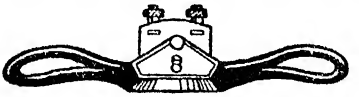


FIG. 7.

Boring tools

A brace such as that in Fig. 8 is the best type. It incorporates a ratchet device (a), which enables the brace to be rotated by a backwards and forwards action when working in a corner where the full sweep of the brace cannot be made.

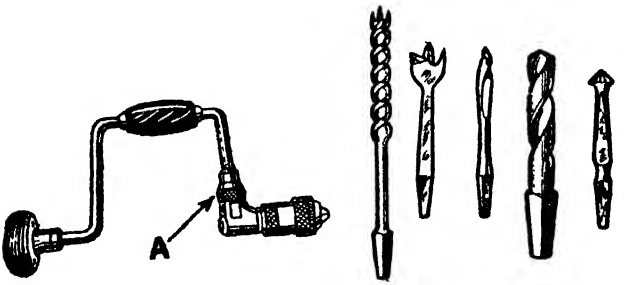


FIG. 8.

Also in Fig. 8 are shown a variety of bits. (b) is a twist bit used for boring deep accurate holes. (c) is a centre bit used for boring shallow holes, as when a recess is to be formed. The bulk of the waste wood is taken away with the centre bit and the recess afterwards trimmed to shape with the chisel. (d) is a gimlet bit used for boring screw holes, and (e) is a drill with a square shank and so is suitable for use in the brace. It may be used for drilling metal as well as for boring screw holes in hard woods. (f) is a countersink bit, used for forming the depression to take the head of a screw.

A useful kit would comprise $\frac{1}{4}$", $\frac{1}{2}$" and $\frac{3}{4}$" twist bits, a $\frac{3}{4}$" centre bit, $\frac{5}{16}$" and $\frac{7}{16}$" gimlet bits, $\frac{1}{8}$", $\frac{3}{16}$ and $\frac{1}{4}$" drills, and a $\frac{1}{8}$" countersink bit.

Bradawls

These are the only other boring tools necessary, and one small and one medium size are sufficient.

Marking out tools

Try squares are made in various sizes and qualities, but the combination square shown in Fig. 9 is the best all round tool for our purpose. The blade is adjustable and can be used as a depth gauge as well as a pencil gauge. It is also a set mitre. Some types include a spirit level set in the stock, and this is well worth the slight extra cost.

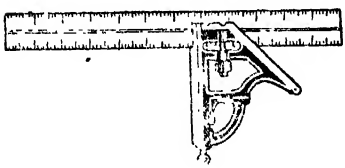


FIG. 9.

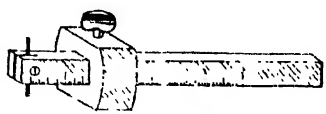


FIG. 10.

Fig. 10 shows a marking gauge. These are inexpensive as well as useful, and two should be bought. The use of two gauges will incidentally render a double toothed mortice gauge unnecessary at least for the beginner.

The Cabinet scraper

This is one of the most useful as well as perhaps the cheapest tool in the kit. It is used after the smoothing plane to remove any

plane marks and to produce a smooth flat surface ready for the glasspaper. It is a real necessity when preparing work for polishing.

Fig. 11 shows the method of using the scraper. It consists of a rectangle of fine steel. The method of sharpening is not complicated but needs a little practice for the knack to be acquired

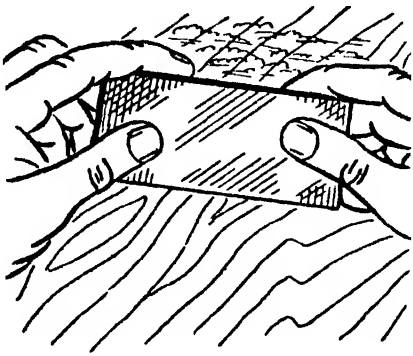


FIG. 11.

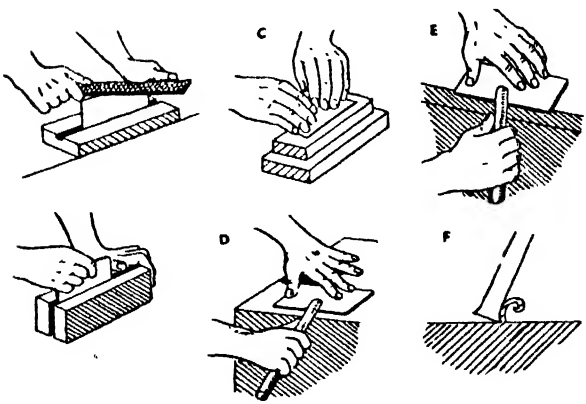


FIG. 12.—VARIOUS STAGES IN SHARPENING THE SCRAPER.
(*a*) Filing edge perfectly square. (*b*) Rubbing edge on oilstone. (*c*) Removing burr. (*d*) Burnishing side with gouge. (*e*) Turning edge with gouge. (*f*) How the scraper works.

(Fig. 12). The first stage in sharpening the scraper consists of filing the edges straight and square with a flat smooth file. The file marks are then removed and the edges given a smooth finish by rubbing them on the oilstone. Care must be taken to keep the edges square on the stone. The scraper is then laid flat on the bench and a scribing gouge is rubbed along each edge in turn. The gouge must be kept quite flat on the surface of the scraper in the manner shown in the illustration. Finally the cutting edge is formed by holding the scraper firmly and drawing the side of the gouge along each edge two or three times. The gouge is pressed firmly against the edge and at an angle slightly off the square, that is to say, at a little less than 90 degrees to the face of the scraper. This produces a keen cutting edge to the tool.

To resharpen the scraper, the gouge is used to repeat the last two processes. The file and oilstone are only required occasionally when a completely new edge is to be formed.

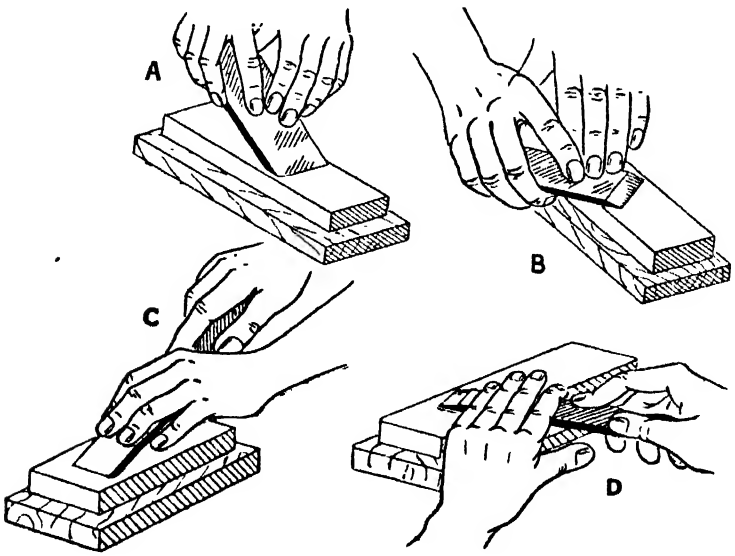


FIG. 13.

(*a*) Sharpening plane iron. (*b*) Removing the burr.
(*c*) Sharpening the chisel. (*d*) Removing burr from flat side of chisel.

Other tools needed are too well known to need description, but even when buying such items as screwdrivers, pincers, hammer, mallet, rule, etc., a little trouble taken in selecting only the best will be repaid.

One final point. It is often possible to acquire tools at second-hand stores, and well-used tools from a tradesman's kit are well worth searching for. Unless, however, the amateur is to some extent experienced it is best to obtain advice from a knowledgeable friend if expensive mistakes are to be avoided.

SHARPENING EDGE TOOLS

No kit, is complete without an oilstone, and it is suggested that a manufactured rather than a natural stone be obtained. I suggest, too, that a double sided stone, having a coarse and a fine side, is the most useful. A chisel or plane iron which has been damaged may often be brought back into use by using the coarse side to remove the gap before the fine side gives the keen cutting edge.

Continual sharpening will eventually thicken the points of edge tools and they will require grinding. Do not use an emery bench grinder to do this yourself ; the heat generated will sooner or later spoil the temper of the tool. Most tool shops operate a grinding service and it is best to use this.

The correct sharpening of edge tools on the oilstone is not a difficult business. Fig. 13 shows the process in some detail.

When purchased, edge tools are ground but not sharpened. Usually only one face of chisels, gouges, plane irons, etc., is made of steel, and on this face is produced the cutting edge. The ground surface is laid flat on the stone and then the hands lifted very

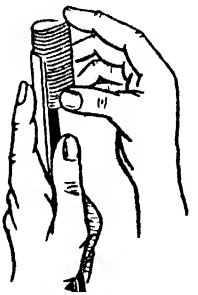


FIG. 14.—USING A SLIP ON THE GOUGE.

slightly so that the contact with the stone is made only at the extreme point. The tool is rubbed back and forth the whole length of the stone and a steady even pressure maintained. The hands should move steadily through the same plane the whole time, or a round instead of a straight cutting edge will be produced.

This action will produce a burr of metal on the cutting edge, which has to be removed. This is done by turning the tool over flat on to the stone and giving it three or four strokes in this position. The experienced joiner usually completes the operation by stropping the edge on the palm of the left hand. This practice is not recommended for the amateur, but the superfine edge thus produced may be achieved by using a strip of smooth leather fixed to a piece of wood and then used in the same way as a razor strop.

The scribing gouge is sharpened by means of a shaped oilstone known as a gouge slip (Fig. 14). The burr formed by the use of the slip is removed on the oilstone.

Before leaving this subject of edge tools, do not forget that the bradawl is as much an edge tool as is the chisel and deserves, though often does not get, the same treatment.

Brace bits are usually sharpened by the use of small fine files or shaped oilstones, but it is very important to preserve the same angle of cutting edge as that formed originally by the makers.

Very few amateurs have the opportunity to acquire the technique of saw sharpening. It cannot be learned from instructions in a book but needs practice under the eye of a craftsman. It is well worth while sending your saws to be sharpened through a good tool shop, and to do this, moreover, when they first show signs of becoming dull rather than leaving them until so much pressure has to be used that there is a danger of distorting and buckling them.

GENERAL CARE OF TOOLS

Tools should be kept in a chest when not in use, and particularly in the case of saws they should be wiped with an oily rag to prevent rust.

Never use a tool after it has become dull ; not only may this lead to bad work and to damage to the tool, but it is positively dangerous. A blunt tool is far more likely to slip or bounce from the work and inflict injury than a sharp one.

SUNDRY EQUIPMENT

Cramps

Steel cramps are expensive and for a beginning use might be made of cramp heads which may be fitted to a straight length of timber. Fig. 15a shows one of the patterns available.

Mitre and square cutting block (Fig. 15b)

This is built up of two pieces of wood glued and screwed together, the screws being put in from the under side. Two or three of these are worth making in different sizes. Never retain the block in service after the saw cuts have so worn as to lead to inaccuracies.

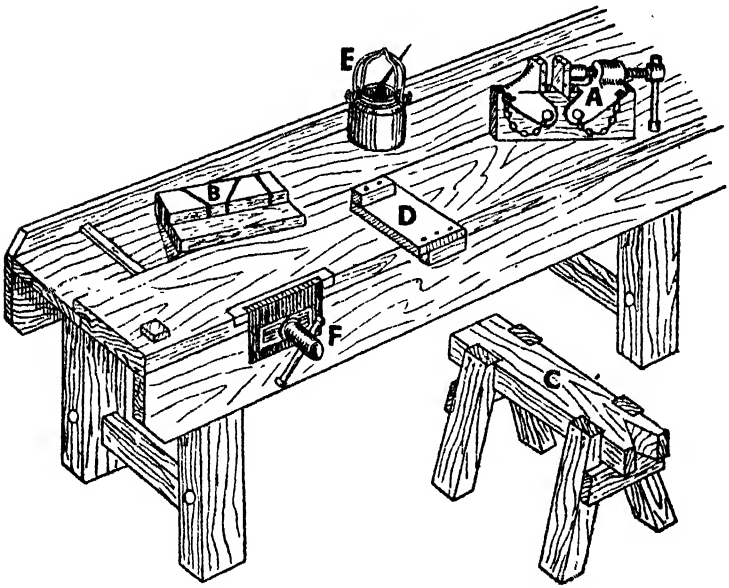


FIG. 15.

The sawing stool (Fig. 15c)

The drawing makes the construction clear. The legs are shown as of 3″ × 3″ timber and the top of 4″ × 3″, but a lighter stool might be made of 4″ × 2″ for both legs and top. Braces of 4″ × 1″ are used across the legs at either end and a " V " notch in one end allows the saw to cut right up to the end of a board without damaging the stool.

Bench hook (Fig. 15d)

An easily made gadget of great use when cross cutting on the bench, especially when shouldering tenons.

Glue pot (Fig. 15e)

It is not recommended that the beginner invest in a glue pot. Glue constantly re-heated becomes discoloured and loses its strength. It is better to take advantage of the reliable glues put up in convenient quantities by manufacturers.

The bench (Fig. 15)

This sooner or later becomes a necessity. The one shown is simple and sturdy. It should be at least 6′ long, though 8′ will be better. 2′ 6″ is the normal height, but this may be varied to suit the worker. The upright parts of the legs are of 4″ × 3″ timber, and the 3″ × 3″ rails are tenoned into them. The front board of the top is of 9″ × 2″, or 9″ × 1½″, and must be straight and true. A ¾″ thick board forms the recess at the rear of the top.

The Vice (Fig. 15f)

This is the most useful type of vice. It is of steel and should have aws at least 6″ wide.

Chapter II

MATERIALS FOR THE WOODWORKER

Under this heading will be considered timber, including manufactured products, fixings such as nails, screws, bolts, etc., and fittings such as locks and hinges.

Timber

Most of the timber used by the amateur woodworker will be obtained from the local timber yard, and unless you are an old customer with the fullest confidence in your source of supply, it is a good thing to visit the yard and make a personal choice of your material. One exception to this rule is in the case of a reputable handicraft magazine, such as *The Woodworker*, carrying advertisements in its columns for ready cut and prepared parcels of timber for the making of items forming the subject of articles in the magazine. Such parcels are products of specialist firms, are generally to be relied upon, and are a convenient method of obtaining the correct quantity of timber for a particular job with no waste. Such firms will also prepare parcels to customers' cutting lists.

One point in connection with the ordering of timber must be stressed. Timber " in the rough "—that is, left as it comes from the saw—is sold at its actual size. This means that 3″ × 2″ timber measures 3″ × 2″. " Prepared " timber, however, is sold in " nominal " sizes and after 3″ × 2″ timber has passed through the planing machines its size will be $2\frac{7}{8}$″ × $1\frac{7}{8}$″. Due allowance must be made for this.

The same rule holds good for beadings and mouldings. A 3″ wide moulding will measure $2\frac{7}{8}$″. Plywood, laminboard and other manufactured products will usually measure the full size as quoted. Plywood is often quoted in metrical thicknesses.

When choosing timber at the local yard avoid pieces with large knots, especially if these are " dead " knots which will fall out, leaving a hole. Avoid, too, twisted and distorted grain except in certain hardwoods such as oak, where polishing will reveal their beauty. Blue streaks in softwoods are not good, but most important of all reject anything which shows signs of woodworm bore holes. These holes are made by the adult wood beetle as it leaves the timber after tunnelling away for anything up to two years, and it

is almost certain that there will be two generations of grubs still at work in the timber. Such timber introduced into the house may well lead eventually to a serious attack not only in furniture but in the actual structural timbers.

Apart from the better-known softwoods generally classed under the name of "deal," the choice of timber for a particular job has become more complicated during recent years. So many hitherto unknown woods from the Commonwealth have been imported that even a bare list of them would be outside the scope of this book. It is better to take the advice of a reliable merchant in making a choice from his stock.

Plywood

The invention and development of plywoods and similar manufactured boards has revolutionised the design of joinery and furniture during the last thirty years, and much edge to edge jointing has become unnecessary.

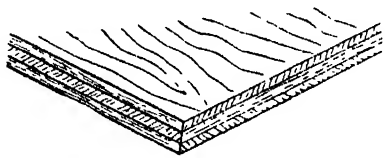


FIG. 16.

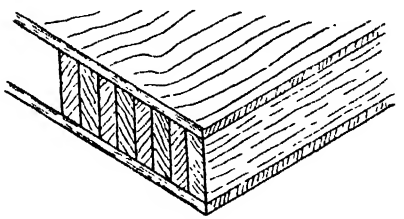


FIG. 17.

Since the war there have also been great advances in the production of patent boardings and sheetings of various thicknesses and densities. Many of these may be sawn, planed and generally worked in the same way as natural timber and form a very useful source of materials for the amateur as well as for the craftsman and manufacturer.

Plywood (Fig. 16) and laminated wood (Fig. 17) are often covered with an outer skin of valuable wood over a more common variety, and such materials may also be obtained with an outside face of metal such as steel, copper, stainless and chromium plated steel.

While still dealing with manufactured items, mention must be made of ready-made mouldings, beading, and also of ready-turned and shaped legs, rails and other members. Some of these purpose made mouldings are of great use to the amateur not only for decorative but for constructional purposes.

Second-hand materials

Considerable economies may be effected by the use of second-hand materials, and the worker who has in his district a good second-hand yard will find it a veritable gold mine not only of cheap, well-seasoned timber, but even of ideas. The sizes and construction of some discarded shop fitting or of a section of old panelling from a public house might suggest the design of a fitting or piece of furniture of which it might form the basis. The remarks previously made about the danger of woodworm infection applies with even more force to materials from such sources, however, and every care must be taken in selection.

Auction sales of furniture are often valuable sources of materials if opportunity offers. Large solid items of Victorian furniture are often great bargains ; it is quite usual for a huge wardrobe or sideboard to yield an amount of fine timber out of all proportion to its cost at auction.

Finally a source of material often neglected is the grocer's and greengrocer's shops. Much excellent timber may be salvaged from clean empty boxes and cases sold generally for firewood, and a number of these boxes carefully taken to pieces forms a useful stock.

FIXINGS

Nails

Fig. 18 snows a number of hammer driven fixings. (a) is an ordinary wire nail for use where strength and not appearance is a consideration. These are obtained in various thicknesses and lengths up to 6″. (b) is an oval nail or oval brad, perhaps the most useful nail for the amateur joiner. The head is so shaped as to be inconspicuous when driven, and its oval shape facilitates its entrance into the wood without splitting. 1″, 1¼″, 1½″ and 2″ are the most useful lengths.

(c) is a screw nail. As it is driven it twists, and it is most useful for fixing to soft bricks, breeze, etc.

(d) is a wrought nail, sometimes called a cut nail, and it is used where great strength is required. This, too, is made in lengths up to 6".

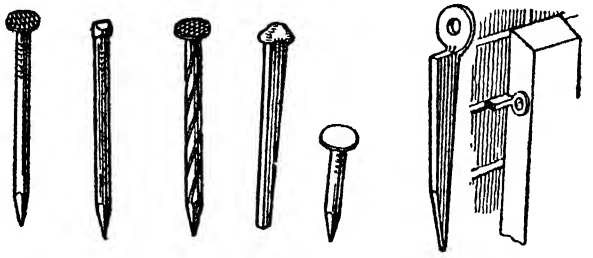


FIG. 18.

(e) is a clout nail and is used where its big head is an advantage in preventing materials such as roofing felt from tearing away. For outdoor work the galvanised clout nail should be used.

The wire nail, too, is sold in galvanised form for outdoor work such as fencing.

Nails not shown are panel pins, which are thinner than a wire nail and with a smaller head, and veneer pins which are even thinner.

Finally the hold-fast (f). This is driven into the joints of brickwork and is useful for fixing posts and other timbers which abut to a brick wall, as shown.

Screws

In Fig. 19 is seen a number of the more usual types of screws.

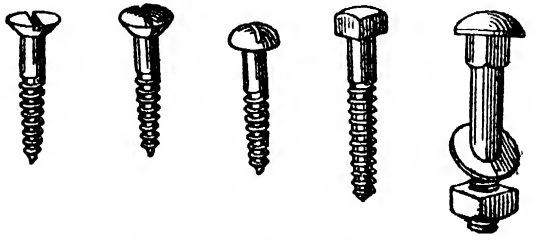


FIG. 19.

Screws are made in a variety of metals for various purposes and are available in lengths from $\frac{1}{4}$" to 6". The thickness of screws is stated as a number—the lower the number the thinner the screw. Thus a number 10 screw is thicker than a number 8.

(a) is a countersunk headed screw ; (b) a raised head ; (c) a round head ; (d) is a coach screw used, like the wrought nail, for strong fixing. Coach screws are made in thicknesses expressed in fractions of an inch, $\frac{1}{4}$", $\frac{5}{16}$", $\frac{3}{8}$" and so on. This thickness refers of course to the unthreaded shank.

Finally (e) is the bolt most used in constructional woodwork. It has a raised or " snap " head under which is a square to prevent the bolt rotating when the nut is tightened up. Length and thickness of bolts are expressed in inches and fractions of an inch. Bolts may also be obtained with square, hexagonal and countersunk heads.

Plug fixings

Fixings to solid walls and to hollow partitions are problems which have received a good deal of attention from manufacturers in recent years, and the result has been a complete swing away from the old-fashioned wood plug. Fig. 20 shows the fibre plug which, fitted to a hole made by a wall drill, results in a perfect fixing.

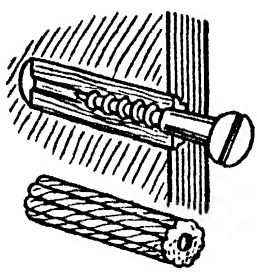
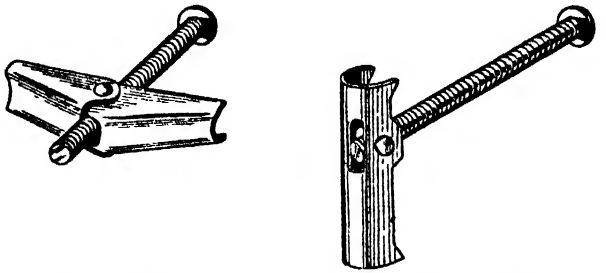


FIG. 20.

Another method of plugging, fast becoming deservedly popular, involves the use of a plastic filling. A hole is drilled in the wall and the plastic, moistened with water to form a putty, is rammed into the hole. An immediate firm fixing results, and one more advantage of this method is that, no matter if the hole be irregular, once it is rammed full the fixing is just as good as if the hole were regular and

accurate. It follows, therefore, that a hole left by a fitting which has pulled away from the wall may easily be filled for refixing in this way.

Sheeted partitions and walls of hollow brick present a different problem, and in Fig. 21 are shown two answers to it. These are the spring toggle and the gravity toggle.



Spring Toggle. Gravity Toggle.

FIG. 21.

The first of these has two wings which are spring loaded and collapsible. A hole being drilled in the partition, the wings, collapsed, are pushed through, whereupon they fly open in the form of a butterfly nut and afford firm fixing to the sheeting of the partition.

The gravity toggle is also pushed through a hole and as it clears the sheeting it drops to a perpendicular position and again affords a solid grip.

One more point about fixing to partitions. These are supported on a series of perpendicular studs or uprights, and the skirting board at the base of the partition is nailed to the bottom of the uprights. The position of the fixing nails can usually be traced even through paint, and will give the position of the studs which afford firm fixing.

FITTINGS

Hinges

Fig. 22 shows an ordinary butt hinge as used on interior and exterior doors. Hinges used for cabinet work are similar but the wings are narrower in proportion to their length. It is usual for both wings to be recessed into the wood, but it is a mistake to suppose that when the wings are recessed so that they are flush, then the right clearance for the door will be achieved. That depends on

the depth of the knuckle part of the hinge in relation to the thickness of the metal of the wings.

The best method of ascertaining the correct depth of the recess for the wings is as follows:— The hinge is closed and the width of

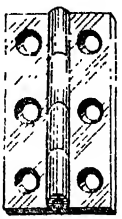


FIG. 22.

the knuckle measured. Assuming that this width is found to be $\frac{1}{4}''$ and it is proposed that the door shall have a joint of $\frac{1}{8}''$, then each wing must be recessed to a depth of $\frac{1}{16}''$. Fig. 23 shows the reason for this.

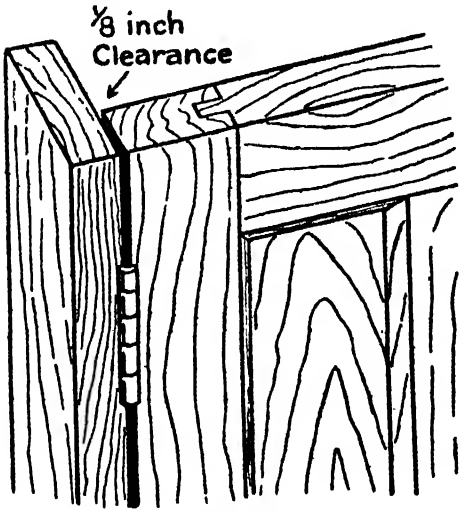


FIG. 23.

Other types of hinge likely to be met with in jobs about the home are the cross garnet or tee hinge (Fig. 24) and the back flap (Fig. 25). The cross garnet, like the back flap, is merely screwed on the surface of the wood and no recessing is needed.

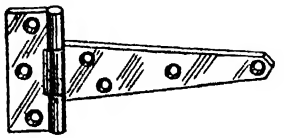


FIG. 24.

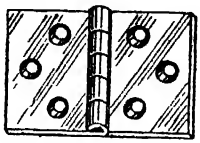


FIG. 25.

The cross garnet is used on light doors such as those made of tongue and grooved timber. The leaf or strap of the garnet should extend at least half-way, and preferably two-thirds of the way, across the door, and the use of garnets with too short a strap is a frequent cause of failure.

The back flap is made to open full circle. This, too, is often used on light doors where appearance is not a consideration, and one often finds them also in use to hinge the back frame of household steps.

Locks

The two types of lock we shall be most often called upon to fit are the cupboard and drawer locks.

Fig. 26 shows a cupboard lock, and apart from the cutting of the keyhole the fitting is simple, as the lock is merely screwed to the inside face of the door and frame. Fig. 27 shows the cutting of a

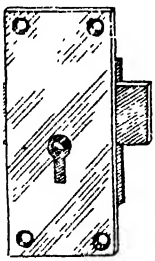


FIG. 26.

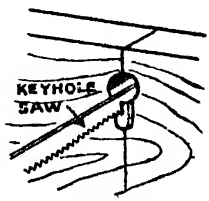


FIG. 27.

keyhole. A hole is bored which will afford easy clearance to the key, and two saw cuts are then made down from the hole with the keyhole saw. The waste wood is then cut away with the chisel.

The fitting of the drawer lock is shown in Fig. 28. The body of the lock is recessed into the inside of the drawer front. Saw cuts are first made as shown and then the waste wood is chiselled away. Often only the body of the lock is recessed, but in the best work the back plate is also let in as shown. Afterwards the keyhole is cut.

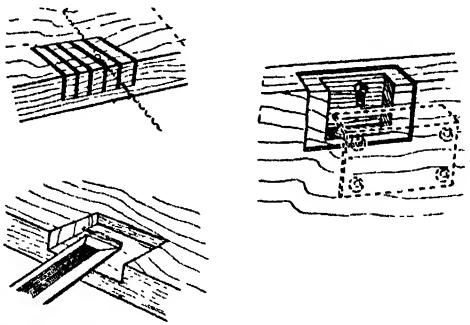


FIG. 28.

When making furniture which is to be fitted with locks, it is best to cut the mortise for the lock bolt before the furniture is assembled. If this is not done, or if a lock is to be fitted to an existing piece of furniture, then a drawer lock chisel must be used. Fig. 29 shows a drawer lock chisel, so made that it can be used between the members of a framework where there would not be room for an ordinary chisel.

FIG. 29.

There are, of course, many hundreds of items which can be classed under the heading of " Fittings " and it would be impossible

to deal with a tithe of them here. It is suggested that if possible an ironmonger's catalogue be obtained—an old one will do. A study of its pages will often solve the problem of what fitting to purchase for a particular job.

Chapter III

JOINTS

The satisfactory completion of any piece of work depends entirely upon the accurate marking-out and working of the joints used in its construction, and for this reason the reader is advised to practise the joints listed in this section until they become as familiar to him as the tools he uses to make them.

A few hours' practice on odd scraps of wood will save disappointment and expense when big jobs are undertaken, and it cannot be too strongly emphasized that the worker should put away all thoughts of bigger things until he has thoroughly mastered the making of these joints.

The use of each particular joint, together with step-by-step instructions, are given now as in later chapters the dimensions of the joints only will be given, it being assumed that the worker can turn out each or any of them easily and confidently.

This list does not pretend to be an exhaustive one, particularly as many joints are only developments or combinations of simpler ones. " Mitre " joints and " Dovetail " joints, for instance, can be amalgamated into what are called " mitre-dovetails ". This list is sufficiently long, however, to cover the ground required for this book and any slight variation needed for any particular job will be explained in detail as the occasion arises.

MITRE JOINTS

Used in light work, mouldings, etc., to join two pieces of wood at right angles. The end of each length is sawn across at an angle of 45°, the cut ends of each length placed together and the joint secured with glue, nails, or with a wooden " key ". The cutting of the necessary 45° angles is made easy by the use of a mitre-box or mitre-block.

The ideal example of the mitre-joint is, of course, the joint at the corner of a picture frame. Apart from picture framing and the fitting of mouldings around panels, etc., the uses of this joint are very limited, and as mitreing is one of the most simple operations in joinery nothing further need be said about the joint.

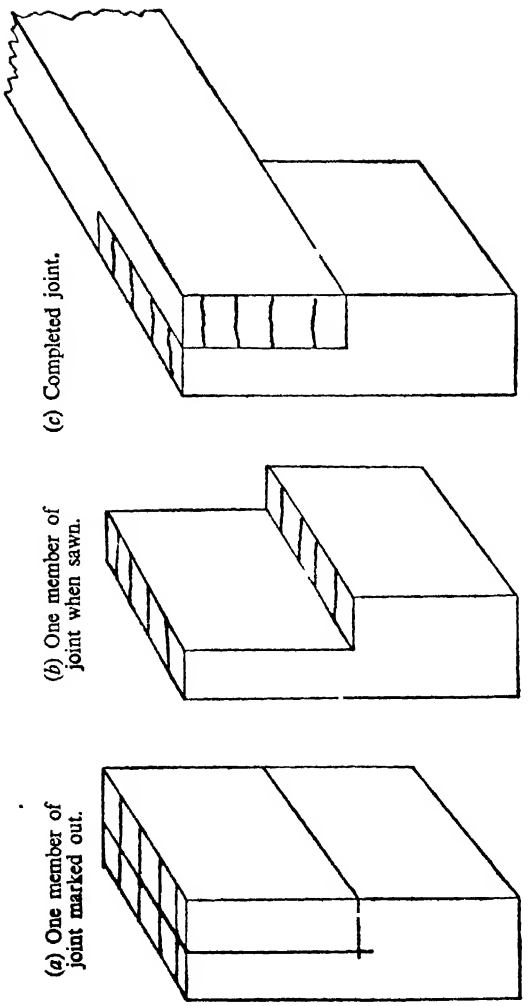


FIG. 30.—THE HALVED JOINT.

THE HALVED JOINT

Used for joining timber either at right angles or lengthways. It is a particularly easy joint to make, yet is capable of withstanding great strain. Most satisfactory when fairly thick pieces of wood are being jointed, and is chiefly used in the making of framework. A combination of glue with screws, nails or wooden pins is most usual for holding the joint together.

Marking-out and Working

To make the joint at right angles.

Saw off one end of both pieces of wood dead square. If both pieces of wood are the same width mark back from the sawn end of each piece a distance equal to the width of the wood. With the square and chisel scribe a line across the face-side of one width and bottom of the other at the distance so measured. These lines are known as " shoulder lines ".

If the widths to be jointed are different, measure back a distance equal to the narrowest of the two widths on the length of wood with the greatest width, and vice versa, but in this case both lines are scribed across the face side of the work.

In both cases carry the scribed lines down the face- and opposite edges with the square to a point just over half the thickness of the wood.

Set a marking gauge to half the thickness of the wood, if both thicknesses be equal, and working from the scribed faces gauge from the scribed lines on the edges to the end of the wood and across the end grain (see Fig. 30a). In a case where the pieces being jointed are of unequal thickness the gauge should be set to half the thickness of the thinner piece and the gauge lines marked from the face-side of each.

Using a tenon saw, cut down the gauged lines to the scribed lines and then across the shoulder lines, thus removing a small rectangular block from each length (see Fig. 30b).

The sawing should be done with the greatest of care as the strength of the joint depends entirely on the snugness with which the two sawn surfaces fit together. Any slight irregularity in the sawing should be corrected by the use of a chisel.

The completed joint can now be laid together and either glued and screwed, nailed or pinned as desired (see Fig. 30c).

THE DOVETAIL JOINT

For jointing relatively wide but thin pieces of wood at right angles. A very neat-looking joint but extremely strong. Most frequently used in the making of boxes, chests, etc. This joint may

be made with slight modifications, two of which are explained below.

The " dovetails " themselves are cut on one piece of wood and the " pins " on the other, the dovetails usually being on the longer of the lengths being jointed. There are two alternative methods of making the joints, (*a*) by making the pins first and marking-out the dovetails from them, and (*b*) by reversing that procedure. There is little to choose between either method, and the worker should experiment with both and adopt the method to which he feels most suited.

Before proceeding with working instructions, the following points about pins and dovetails should be noted.

A pin is always to be left on the two outside edges of the joint and *not* a half-dovetail (see Fig. 31). The slope of the pins (and consequently of the dovetails also) should be about one in eight. Their thickness at their narrowest side should be one-quarter the thickness of the wood being used.

With regard to the dovetails, these at their widest part should normally be between one and a quarter and one and a half times the thickness of the wood.

These dimensions can only be regarded as approximate, as slight adjustments may have to be made, according as to whether the pins or the dovetails are marked-out first, or to meet the needs of some particular job.

To see how this turns out in practice, assume that two pieces of wood 9½" wide by 1" thick are to be dovetailed.

First Method—by Cutting the Pins First

Saw off one end of both pieces of wood dead square. Measure back from the end of each piece a distance of 1⅛", i.e. the thickness of the wood plus ⅛" to enable the pins to be pared off neatly afterwards.

Scribe a chisel around all four sides of both pieces of wood at this distance, and turn one piece of wood up so that the measurements for the pins can be made along the end grain.

According to the notes given above the thickness of the pins in this joint must be ¼" at their narrowest.

From each edge and along the face-side mark in a distance of ¼" for the two outside pins. This leaves 9" to be divided up among the remaining pins and dovetails. There will be one more dovetail than there are pins and a little rough marking-out on an odd piece of wood would show that the figures that most nearly approximate to the rules given previously are six dovetails with five pins.

Mark the centre points of the five inside pins at a distance of

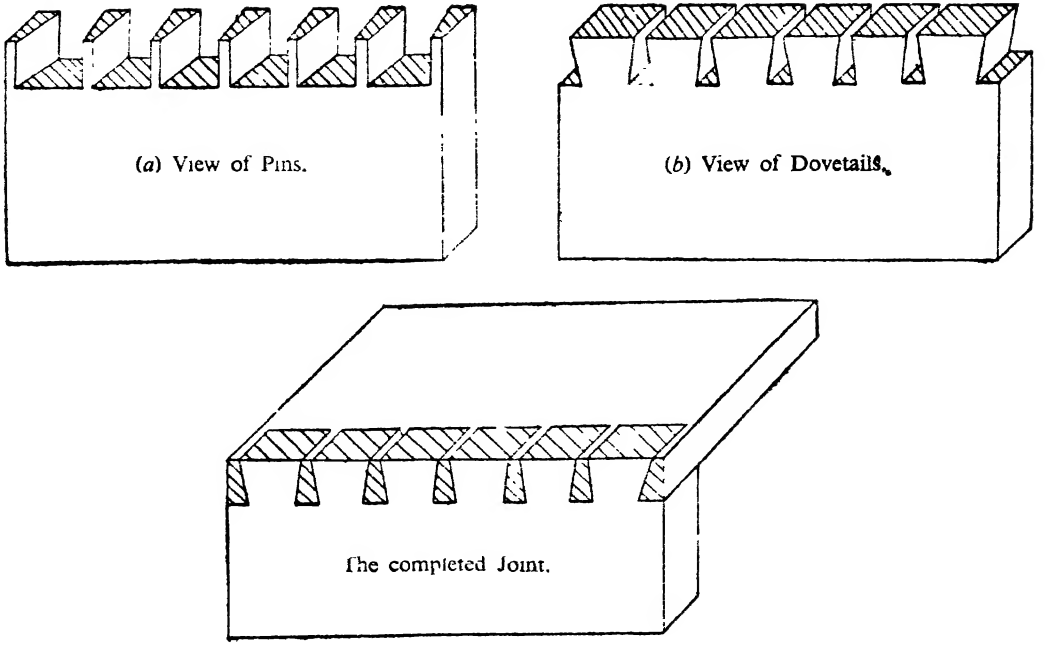


FIG. 31.—THE COMMON DOVETAIL JOINT.

1½″ apart along the face-side. Rule the centre lines of pins right across the end grain and then mark a distance of ⅛″ on both sides of each centre line to mark the thickness of the pins on the face-side.

As already explained the slope of the pins must be one in eight and as in this case the wood is 1″ thick it is obvious that the difference in measurement between the narrowest and the widest part of each pin will be ⅛″ on each side of each centre line.

On the opposite edge of the end grain to that already marked, measure in from each edge a distance of ⅛″. Draw pencil lines from these two points to the two outside ¼″ markings on the face-side and the requisite bevel for the pins will thus be obtained.

If the worker is in possession of an adjustable bevel all that needs to be done is to adjust the blade to the slope so marked, and mark off each pin in turn. Should he not own a bevel he must mark off ¼″ on each side of the centre-lines of pins on the back edge of the wood and connect them to the markings on the front edge.

Having marked the bevels rule lines, with the aid of the square, down to the shoulder line previously scribed around the four sides. Saw down the outlines of the pins to the shoulder line with a dovetail saw and chip out the waste wood between the pins with a mallet and chisel.

When doing this, start about ¼″ away from the shoulder line. Place a suitable sized chisel between a pair of pins, give the top a sharp tap with the mallet, shift the chisel about another ⅛″ up and tap it in at a slight angle, so removing a small ship of wood between the first and second cuts.

Repeat this operation until half the thickness of the wood has been chipped through, then turn the wood over and repeat the chipping from the other side until the waste wood has been completely chipped out. The fact that the pins slope from back to front should not be lost sight of, and care must be taken not to allow the chisel to cut into a pin.

When the greater part of the waste has been chipped out the remainder can be pared off neatly with a chisel down to the shoulder lines (see Fig. 31a).

Having completed the pins, stand them upright on the piece of wood reserved for the dovetails so that their "bases" (i.e. the thickest part of the pins) rest on the shoulder lines.

Mark round the outline of each pin with a pencil.

Saw down these pencilled lines to the shoulder lines with a dovetail saw and remove the small portion of waste between each pair of dovetails with mallet and chisel. The two outside portions should be sawn off, not chiselled. The completed dovetails will then appear as Fig. 31b.

The finished joint should be "hand-tight"; that is to say, it

should be capable of being fitted without being hammered or tapped, but merely by a slight pressure of the hands when fitting the pins into the dovetails. If tapping is found to be necessary a small piece of wood should be laid on each dovetail in turn and the blows struck on to the wood and not directly on the joint.

If correctly jointed the two pieces of wood should form a perfect right-angle, a point of great importance in the making of boxes, etc. It is therefore as well to fit the joint together and check the angle with the square before any attempt is made to glue up.

The joint is held together by glue brushed on to the pins which are then pushed into place. In some cases it may be necessary for a nail to be driven into one or more of the dovetails, but such a practice is not to be recommended and is usually only forced on the worker by his own careless work.

After the glue has dried the slight projecting portions of the pins and dovetails are planed off, care being taken not to split out the end-grain of the two outside pins. The completed joint will then appear as Fig. 31.

Alternative Method of Construction

By making the dovetails first.

The work is started as before by sawing off the ends of the wood dead square and scribing shoulder lines around both pieces of wood.

The number of dovetails required is worked out on an odd piece of wood ; if a convenient measurement can be obtained centre points for each dovetail are marked-out equidistant along the shoulder line. As the wood in the particular joint we are considering is $9\frac{1}{2}''$ wide these centre points would be $1\frac{5}{4}''$ apart, an unusual and inconvenient distance to be marked-out.

The width of $9\frac{1}{2}''$ has been specially chosen to draw attention to one of the preceding paragraphs in which it was stated that modifications of sizes might have to be made according as to whether pins or dovetails are marked first.

If the measurements for the centre points of dovetails had been some more convenient figure such as $1\frac{1}{4}''$ or $1\frac{1}{8}''$ it would have been a simple enough matter to have marked-out the dovetails by straightforward measurement, but as carpenters' rules usually contain no smaller sub-division of an inch than $\frac{1}{16}''$ the size of the dovetails in this and similar cases must be adjusted accordingly.

The reader should therefore closely follow the reasoning given below in order that at any future time he may be able to cope with similar awkward measurements.

Before starting to mark-out a pencil line should be drawn around all four sides of both pieces of wood $1''$ away from, and above, the shoulder line in order that the top measurements for the dove-

tails may be made along it. This will ensure that when the bevels are being marked they will be kept at their correct slope of one in eight.

Along the pencil line measure in from each edge a distance of $\frac{1}{4}''$ for the two outside pins. To conform to the slope of one in eight the distance to be measured in along the shoulder line will be $\frac{3}{8}''$. Connect up the two points at each end, so marking the outside bevels of the two outside dovetails.

Along the shoulder line there now remains a distance of $8\frac{1}{4}''$ to be divided up between six dovetails and five pins. The pins being $\frac{1}{2}''$ wide at their base will account for $2\frac{1}{2}''$, leaving $6\frac{1}{4}''$ for the dovetails. Thus by adjusting the size of the two outside dovetails to $1\frac{1}{4}''$ each and the four inside ones to $1''$ each, along the shoulder line, the dovetails and pins can be satisfactorily marked-out.

From each of the two slopes already marked, measure in along the shoulder line a distance of $1\frac{1}{8}''$ and then a further $\frac{1}{4}''$. Along the pencil line and from the edges of the two outside dovetails, measure in $1\frac{3}{8}''$ followed by $\frac{1}{4}''$. Connect up the four points by pencil lines and then continue marking-out dovetails and pins at distances of $1''$ and $\frac{1}{2}''$ respectively along the shoulder line and $1\frac{1}{4}''$ and $\frac{1}{4}''$ along the pencil line.

An alternative, and in this case a better solution to the problem, would have been to work by measurement along the pencil line, marking-out the shapes of the pins, with centre-lines of pins at $1\frac{1}{2}''$ apart. This would have resulted in all pins being exactly the same size, but this solution is not always possible. By one or other of these methods, however, it is always possible to deal with an awkward measurement, and the most suitable should be adopted, according to the particular dimensions involved.

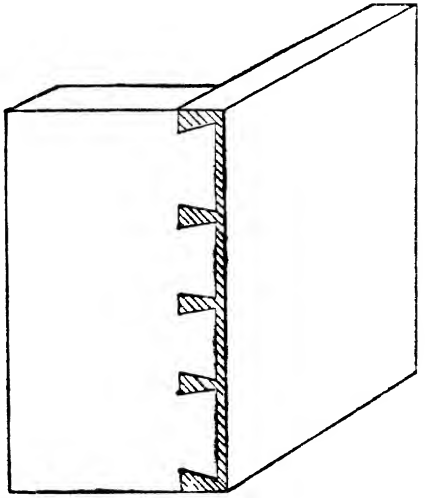
The dovetails, having been marked out, are sawn down to the shoulder line with a dovetail saw.

The piece of wood on which the pins are to be cut is taken and turned end-grain uppermost and secured to the edge of the table or in a vice.

The sawn dovetails are laid across the end-grain in the position that they will occupy in the finished joint, a dovetail saw laid in the saw-cut of the dovetails and then drawn sharply across the end-grain of the piece of wood beneath. This practice is known as "scratching-in", because the position of the pins is literally scratched on to the end-grain.

The remaining procedure closely follows that explained in the previous method. Using the scratch lines as a guide the pins are sawn down, the waste on both dovetails and pins removed with mallet and chisel, and the joint tested and glued up as before.

So much for the common dovetail. Now let us consider the



(*b*) The completed joint.

(*a*) View of pins.

FIG. 32.—THE DRAWER DOVETAIL JOINT.

DRAWER DOVETAIL

This joint is reserved almost exclusively for the front edges of drawers. It has all the strength of the common dovetail with the added advantage that the joint is completely hidden from the front (see Fig. 32).

Little need be said about the making of this joint.

The pins are cut first, but a line is first gauged across the end-grain at a suitable distance from the face-side and the pins marked-out between this line and the back-edge of the wood.

It will be seen that it is impossible to saw out the whole of the outlines of the pins as they do not extend right across the grain, but by holding the saw at an angle it is possible to saw down a good proportion of the pin and the remainder must be taken out with a chisel. The great point to be watched is that the pins are not split when chiselling down the gauged line across the end-grain. Fig. 32a shows a view of the completed pins.

The dovetails themselves have to be cut to their exact size and no allowance is possible for waste. Glue is used to hold the joint as with the common dovetail.

THE DOVETAIL HALF-LAP

A variation of the dovetail joint much used in light framing. Wood of $\frac{1}{2}''$ or more thick is suitable for the joint which consists of one dovetail only let into another piece of wood.

Method of Marking-out and Working

Assume that the wood to be jointed is 2″ wide by 1″ thick.

Saw off dead square the end of the piece of wood on which the dovetail is to be cut, measure back a distance of 2″ from the end and scribe a shoulder line around all four sides with a chisel.

Where the dovetail is to be fitted on the second piece of wood mark two pencil lines, 2″ apart, and carry them down the face— and opposite edges for a distance of about $\frac{1}{4}''$.

Set a marking gauge to $\frac{1}{2}''$ and working from the face-side in both cases gauge lines down both edges and across the end-grain for the dovetail, and down both edges between the pencil lines of the other piece of wood.

Saw down the gauge lines to the shoulder line on the piece of wood for the dovetail, and across the shoulder line on the bottom of the wood (i.e. the side opposite to the face-side), so removing a small block 2″ long, 2″ wide and $\frac{1}{2}''$ thick.

The dovetail is marked-out on the half-thickness of wood left. Along the shoulder line measure in from each edge a distance of $\frac{1}{4}''$ and connect these two points to the top left- and right-hand

corners. As the dovetail measures 2" long the distance of ¼" measured in will give the correct slope of one in eight.

Saw down the outline and across the shoulders of the dovetail.

Lay the dovetail between the pencil lines on the other piece of wood and mark off the slopes with a pencil. Working on the inside edge of the sloping lines, saw down them to the gauge-line.

To assist in removing the waste wood a series of saw-cuts can be made across the wood between the two sloping cuts marking the edges of the slot. The waste wood is taken out with a chisel working from each side of the wood in turn to avoid splitting out the back of the slot. When the greater part of the waste has been taken out the bottom of the slot should be pared down until it is perfectly level.

It should now be found that the entire joint fits together hand-tight but if any slight irregularity does exist it can be corrected with the chisel.

Dovetail half-laps are usually either glued or screwed to hold the completed joint securely.

THE HALF-LAP JOINT

This joint can be dismissed in a few words. It is used for much the same purposes as the dovetail half-lap but in positions where little or no tension acts upon the joint. The only difference in

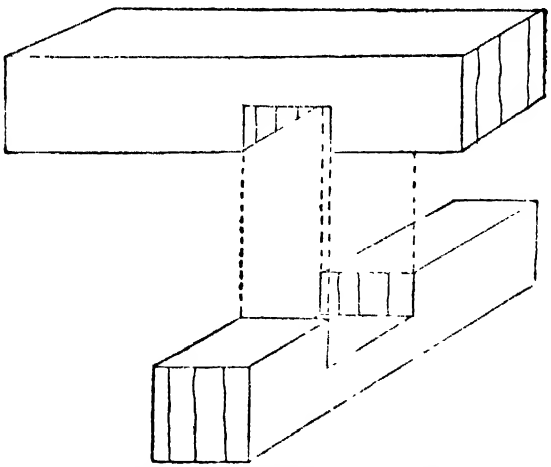


FIG. 33.—THE CROSS-CHECK JOINT.

construction is that the half-thickness of wood projecting on the one portion of wood is not shaped as a dovetail and in consequence the slot on the other piece of wood is simply cut straight across the grain.

Another form of the half-lap (known as the " cross-check ") is used for crossing two pieces of timber. In this case a slot, equal in width to the width of the timber being used and in depth to half the thickness, is cut on each of the two members of the joint and is fitted together as shown in Fig. 33.

DOWEL JOINTS

Used for right-angle joints, especially in light furniture. It is an exceptionally neat and strong joint. The brace and bit is an essential tool for the construction of it, but it should be noted that the mortise and tenon joint (see below) can nearly always be substituted for the dowel joint if the reader does not possess the brace and bits.

" Dowels " are round wooden pins of varying thickness made from hard woods such as oak and beech. One or more dowels are used according to the width or length of the wood being jointed.

Although dowels can be used for butt joints they are more commonly used for end-grain to edge jointing, and it is this form of joint that is explained below.

One point that should be kept in mind when dowelling is that the diameter of the dowel should be equal to one-third the thickness of the wood being jointed.

Method of Marking-out and Working

To find the number of dowels required for any width of wood over 2″ work on the assumption that one dowel will be required for each 2″ of width but, when marking-out the dowel positions, mark the centre of the two outside dowels ¾″ in from the two edges and space out the remaining dowels equidistant. When the width of the wood does not exceed 2″ one dowel placed centrally will suffice.

Saw one length of timber to the required length, paying particular attention to the squareness of the cut. Working from the face-side draw lines across the end-grain to denote the centre-lines of dowels in the positions indicated by following the instructions given in the preceding paragraph. Set a marking gauge to half the thickness of the timber and, still working from the face, gauge across the pencil lines to mark the exact centres of dowels.

With pencil and gauge duplicate these markings on the face-edge of the second piece of wood so that when both are laid in their correct positions the centre-marks will coincide.

Using a brace and a bit of suitable size for the dowel, bore holes in the end-grain and face-edge to a depth of just over half the width of the wood, or to a depth of 1½", whichever be the smaller.

The dowels may either be made up by the worker himself by shaping a piece of hard wood with a chisel, or else purchased from a woodworkers' supply shop. They should be cut into lengths slightly less than twice the depth of the holes bored. Along the edge of each dowel a small saw cut is made to allow surplus glue to escape, whilst each end may be slightly tapered off to assist them into position.

Each dowel in turn should have one end dipped into boiling glue and is then tapped into place in one of the holes bored in the end-grain. When all dowels have been thus treated the projecting halves of the dowels are brushed with glue and are forced into place in the holes bored on the face-edge of the other piece of timber.

It is obvious that this joint will only be a success if the holes have been bored dead straight and care must be paid to that point.

A cramp will be of great assistance when gluing a dowel-jointed framework but if the worker is not in possession of this he can improvise one according to the directions given in the section on " Home-made Tools and Accessories ".

THE REBATE JOINT

Used on the edges of long boards such as the " skin " of wooden huts or sheds, or for rough floors, as its name implies, this joint has a " rebate " (similar to that on a picture frame) worked on one or both edges. To all intents and purposes it is a halved joint along the edge of a board instead of across the grain.

THE GROOVED AND TONGUED JOINT

This is used for much the same purposes as the rebate joint, but in better quality work. A projecting tongue on the edge of one board fits in a corresponding groove on the other. Planes can be purchased in pairs to work this joint, one cutting the tongue and the other the groove. Often one edge of the face-side is beaded or both edges slightly chamfered to give a slightly decorative effect when the boards are jointed up.

GROOVE AND FEATHER JOINT

In this joint both edges of the wood are grooved and a thin slip of wood, cut diagonally across the grain to give greater strength, is used in place of the solid tongue. The joint is chiefly used where great widths of timber are required, as in the case of table tops for common kitchen tables, etc.

THE MORTISE AND TENON

For jointing wood at right angles, and may justly be regarded as the most important joint used by the joiner. Examples of this joint are to be found in doors, windows, tables, chairs, gates, wooden buildings, etc.

There are many variations of the joint such as the " double mortise and tenon ", " stump tenon ", " tusk tenon " and so on, but at this stage we shall only study the common mortise and tenon.

The joint has two members. A tongue (or " tenon ") projects from the end-grain of one, and fits into a slot (or " mortise ") cut right through the other. In normal practice the tenon is placed centrally and is one-third the thickness of the wood being jointed.

Method of Marking-out and Working

Assume that the wood is 2″ wide, 1½″ thick, and that the mortise is to be driven through the 1½″ edge.

Saw off the end of the wood intended for the tenon as square as possible and scribe a shoulder line around all four sides at a distance of 2½″ from the end.

On the face-edge of the wood for the mortise scribe two chisel lines 2″ apart where it is intended that the tenon shall fit. Continue these lines down the face-side in pencil and across the bottom edge of the wood with a chisel.

The tenon will have to be ½″ thick and be set in ½″ from each edge to conform to the rules given above.

Special gauges known as " mortise gauges " are available for marking both the lines required on tenon and on mortise with the same operation.

These gauges have two pins, one fixed and one movable. The latter pin would be adjusted to a distance of ½″ from the fixed pin and the stock secured ½″ from the movable pin. The gauge is then held with the stock against the face-side of the timber and lines gauged between the shoulder lines and end of the wood and across the end-grain in the case of the tenon, and between the two chisel lines on face- and opposite edges in the case of the mortise.

If the reader does not own a mortise gauge the marking-out can be done equally as well with an ordinary gauge. This would be set to ½″ and the lines gauged with the stock held first against the face-side and then against the back. The only advantage of the mortise gauge over the marking gauge is that with the former both the required lines are gauged at once.

The tenon is sawn out with a tenon saw, first down the length of the tenon and then across the shoulder lines. Squareness of cutting is essential if the joint is to be a success.

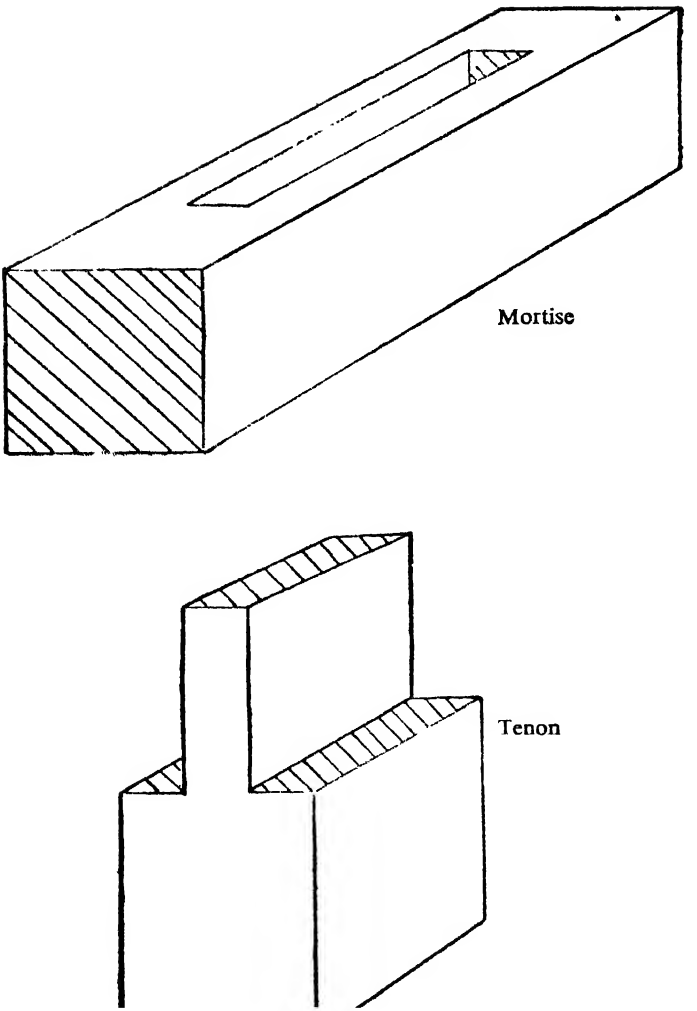


FIG. 34.—THE COMMON MORTISE AND TENON

There are two alternative methods of cutting the mortise.

The first and easiest method is to remove the greater part of the waste with a brace and bit, finishing it by trimming the ends and sides of the mortise with a chisel. It should be noted that the holes should only be bored half-way through the wood, which is then turned over for the same operation to be repeated from the other side.

The alternative method is to chip out the mortise with a mallet and a suitable sized chisel, (in this case a ½" chisel).

Start midway between the two lines marking the ends of the mortise. Drive in the chisel about ⅛", withdraw it, and by working on either side of the first cut alternately take out small chips. Do not work right up to the chiselled lines but leave a small portion to be pared off when the greater part of the waste has been taken out. In order to avoid splitting out the back of the mortise chip only half-way through the wood, reverse it, and continue the chipping from the other edge. Trim up the ends and sides of the mortise with a chisel as before (see Fig. 34).

Mortise and tenon joints for internal work are usually glued, and in external work paint or red lead is substituted for the glue. In doors, windows, and in framing, the joint is also "wedged" to give greater security.

To wedge a mortise and tenon joint, small grooves to take the wedges are cut at the back at the end of the mortise.

The same sized chisel as was used to cut the mortise is used for cutting the grooves, which start from ⅛" up to ½" outside each end of the mortise according to its length, and slope down to a point about half-way down its depth.

Suitable wedges are cut from an odd piece of wood and are glued and hammered into place immediately the joint or framework is glued up.

When wedging is resorted to, particularly in a framework, there is a great tendency for the joints to get out of square if one wedge is hammered in farther than the one on the opposite end of the mortise. Frequent tests must be made with the square and any such tendency overcome by tapping the appropriate wedge or wedges farther in until the joint or framework is pulled back square.

THE GLUE JOINT

This joint is used where two or more boards with a thickness up to 1" each are jointed along their edges to give a greater width. It is a very strong joint and if correctly made is practically invisible.

There is no marking-out in connection with this joint, the construction of which is as follows.

The face-edge of one board and the bottom edge of the next are trued and squared with the plane. One board is secured in a vice and the other laid upon it as though the joint were already made. By peering between the two edges any slight irregularity will immediately be noticed as daylight will be visible between the edges of the two boards.

The part of the joint that is " high " is then planed off and the joint re-tested. This process is continued until no light can be seen at the joint.

Glue is then brushed on to the two edges of the joint. The top board is rubbed along the whole length of the bottom board to force out any surplus glue and to work the remainder well into the grain. After the top board has been rubbed along the bottom two or three times the movement of the boards will become more difficult as the glue gets tacky. The top board is then worked into its correct position and the joint laid aside to dry.

In cases where the length of the joint does not exceed 2′ 6″ the worker is well able to rub the joint himself, but where the length exceeds that measurement an assistant is required. A worker stands at each end of the joint and alternately pushes and pulls the top board until the glue is well worked in.

For drying the joints are stacked against a wall, resting against two narrow strips of wood longer than the width of the completed joint. A series of glue joints can be stacked in the same place by inserting similar strips of wood between them.

The success of the joints depends upon the use of really good glue and thorough rubbing of the joint, but the following two points should also be noted.

When more than two boards have to be jointed for width they are first jointed in pairs, laid aside to dry, and then the different pairs are jointed.

Secondly, if when planing the joints all face-sides are kept facing one way and the face-edge of one board jointed to the bottom edge of the next, the grain will run the same way across the whole width of the finished surface and the final smoothing of the face-side can be done without any fear of tearing up the grain around the edges of the joint.

THE SLOT SCREW JOINT

This joint is somewhat similar to the glue-joint, but is given greater strength by the use of two or more screws in the manner

explained below. Wood of a thickness above ½″ is very suitable for the joint. A brace and bit, however, is necessary.

Method of Marking-out and Working

The joint is prepared by truing and squaring the edges of the wood in exactly the same way as for the ordinary glue-joint.

When the two boards would make a perfect glue-joint the top one is laid aside and the bottom one marked-out for the position of the screws.

The number of these required will vary according to the length of the joint, but as a rough guide it may be assumed that one screw will be needed for each 18″ of length, and that in joints below 3′ 0″ long two screws will be used as a matter of course.

Whenever possible the positions of the two outside screws should be 9″ to 1′ away from the ends of the wood and any remaining screws spaced out at equal distances between them. In joints with a length of less than 2′ 6″, however, the distances will have to be decreased.

At the positions decided upon for the screws pencil lines are squared across the edge. A marking-gauge is set to half the thickness of the wood and short lines gauged across the pencil lines.

Suitable screws, which should have a fairly long shank, are screwed into the wood at the centre points thus indicated in such a manner that the whole of the shank only projects above the edge of the board.

The top board of the joint is then marked-out and worked.

Pencil lines are drawn across the edge of the wood in exactly the same positions as they were drawn on the bottom board.

A second series of pencil lines is drawn 2″ away from each of the first pencil lines and, using the gauge set as before, a short line is gauged across each of the second series of lines only, ignoring the first lines. It is immaterial whether the first line of the second series is measured to the right or to the left of the first line, but whichever side is chosen the remaining lines of the second series must be measured to the same side.

The 2″ distances between each pair of pencil lines are then marked out as mortises, the width of the mortise being the width of the screw shank.

At the centre points marked with the gauge on the second series of lines, holes are bored to a depth of just a fraction of an inch more than the height of the screw shank projecting from the bottom board, and with a bit that makes a hole just large enough for the head of the screw to drop into comfortably.

With mallet and chisel the mortises are chopped out to the

same depth as that of the holes, and the joint is ready for testing.

The bottom board is secured in the vice and the top board dropped over it so that the heads of the screws fit into the holes bored for them.

The top board will then be 2″ out of its correct position and is knocked up into place with a mallet.

It can easily be seen that the mortises allow the top board to pass over the shanks of the screws while the heads cut themselves into the sides of the wood, making a sound and safe joint.

When the joint has been tested and has been found correct the top board is knocked back and lifted off. The screws in the bottom board are given one more complete turn into the wood, glue is brushed on both edges of the joint and the whole reassembled and laid aside to dry.

The rules given in the notes on the glue-joint about the direction of the grain and the stacking of completed joints should also be followed when dealing with screw-joints.

The joints listed above are those most commonly used in carpentry and with a good practical knowledge of them at his finger-tips the reader will have gone a long way towards making himself a reliable craftsman. Patience and practice are all that is needed to turn out first-class joints and although the continual practice may seem monotonous to the man who wants to try his hand at bigger jobs, it is essential. He will earn his reward later when he finds that the ability to turn out first-class joints has resulted in the ability to turn out first-class work.

Chapter IV

UNIT FITTINGS

This is the simplest and yet one of the most effective methods of construction for the home woodworker. It consists essentially of a number of boxes of identical shape which can be arranged in an infinite number of ways.

Fig. 35, shows six of the boxes doing duty as a modern stack bookcase. They can be piled in a single tier to fill a narrow alcove, used singly as small cupboards fixed to the wall as bedhead shelves, used as bathroom or medicine cabinets, and so on. They can be left quite plain or fitted with shelves and doors.

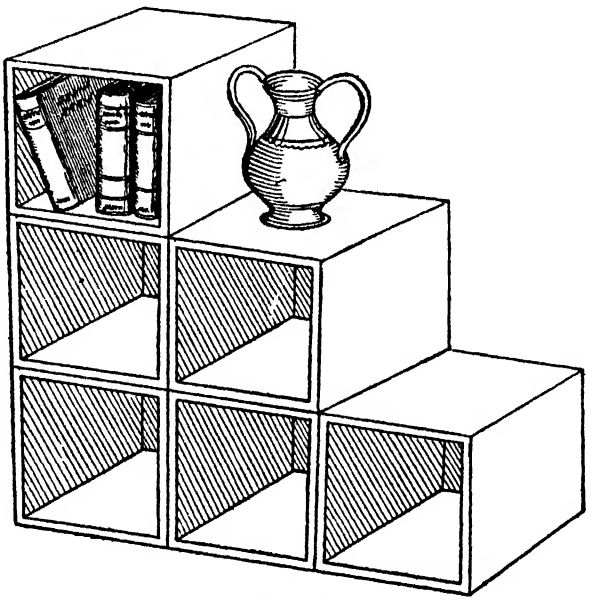


Fig. 35.